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ABSTRACT

Estimates of the rate of return to college frequently omit any reference to differences in investment costs among schools. The return to investments in higher education for a sample of individuals is estimated with specific cost data for each college attended by the respondents. Results show that the variation in investment costs among colleges is an important determinant of earnings. In addition, the estimated rates of return to schooling are lower when all costs are considered, than when years of schooling is used as a proxy for all investment costs. This supports the hypothesis that students with higher earning potential invest more per year of school. Finally, large differences in rates of returns on direct and indirect components of investment are observed. (Author/MJM)

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THE RETURN TO INVESTMENTS IN HIGHER EDUCATION REVISITED

BY

PAUL WACHTEL

72-64

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Graduate School of Business Administration

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October 1972

THE RETURN TO INVESTMENTS IN HIGHER EDUCATION REVISITED*

Paul Wachtel**

Estimates of the rate of return to college frequently omit any reference to differences in investment costs among schools.[1] In this note the return to investments in higher education for a sample of individuals is estimated with specific cost data for each college attended by the respondents. If quality differences among schools, which are reflected in costs, affect the earnings of graduates than cost differences should be considered in estimating the rate of return.[2]

The results show that the variation in investment costs among colleges is an important determinant of earnings. In addition, the estimated rates of return to schooling are lower when all costs are considered, than when years of schooling is used as a proxy for all investment costs. This supports the hypothesis that students with higher earning potential invest more per year of school. Finally, large differences in rates of returns on direct and indirect components of investment are observed.

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The sample used for the study is the NBER-Thorndike survey of World War II veterans. It is a sample of individuals who took a battery of Air Force pilot and navigator tests in 1943. Information from Army records have been updated by mail surveys in 1955 and 1969. The sample is described by Taubman and Wales who have examined the returns to different levels of schooling but use estimates of average costs rather than the institution data collected for this study.

I. The Model and the Data

The basic framework of the analysis is the human capital earnings function developed by Becker and Mincer. The model states that the earnings of the i^{th} person at time t can be written as the sum of an initial earnings endowment,[3] E_{io}, and the sum of returns to all previous human

$$E_{it} = E_{io} + \sum_{j=1}^{t-1} r_{ij} C_{ij}$$

capital investments, $r_{ij} C_{ij}$, where r_{ij} is the rate of return and C_{ij} the cost of investments by the i^{th} person in the j^{th} period. The costs of investments can be expressed as a fraction, k_{ij}, of potential earnings:

$$C_{ij} = k_{ij} E_{ij}$$

Substituting recursively and taking natural logs gives the basic earnings function by approximation:

$$\ln E_{it} = \ln E_{io} + \sum_{j=1}^{t-1} r_{ij} k_{ij}$$

Mincer has pointed out that k is not zero in the post-school years because of investments in on-the-job training. Following Mincer, it is assumed that investments in the form of on-the-job training follow a linear declining pattern over the life cycle. In addition, the log of weeks worked, W, is included as a correction for less than full year employment. Assuming that the returns to college investments are constant for all investments and all individuals and adding a residual term yields the estimating equation:

$$\ln E_{it} = b_0 + b_1 g_{it} + b_2 g_{it}^2 + b_3 \ln W_{it}$$

$$+ r \sum_{j=1}^{s} k_{ij} + u_{it}$$

Labor force experience, g, is measured from the year of first full-time job after high school and s is the number of years of college education.[4] The rate of return is the least squares coefficient on the college investment variable, Σk_{ij}.

Previous estimates of the returns to schooling have been restricted by the availability of data on direct schooling costs. The usual assumption made is that k is equal to one for each year in school. That is, the only costs of schooling are foregone earnings or alternatively direct private costs are equal to the part-time earnings of students. As a result inter-school variation in costs are ignored. The effect of

inter-school cost differences on the return to education has never been examined nor has the validity of foregone earnings as a proxy for total costs been tested.

In this note direct cost data for each college or university attended by the respondents in the sample are used to correctly specify k, the ratio of costs to potential earnings. The total costs of schooling are the indirect costs (foregone earnings) and direct costs. Two measures of direct costs are available. Tuition charges are used as a measure of direct private costs and total school expenditures per full-time equivalent student as a measure of direct social costs.[5] Using expenditures per student as a measure of direct social cost implies that every college has the same homogeneous product, student years. Different product mixes between research, graduate and undergraduate training, sports and intellectual endeavors are ignored at present.

To estimate ex post returns to schooling each k should measure costs as a fraction of potential earnings at the time the educational investments took place. The available cost data post-dates most of the investments. If costs (tuition or expenditures) have become relatively more expensive over time, calculated values of k will have to be adjusted accordingly. The national average expenditures per college student have in fact increased more quickly than earnings in the postwar period. The increase may reflect improvements in the output of colleges, as well as an increase in the relative cost of education. Average tuition charges in private institutions have increased almost as quickly, but tuition charges in public institutions have increased less than wages in general.

Opportunity costs for each individual were calculated from the 1960 Census.[6] For the undergraduate years opportunity costs are the median income of white high school graduates in the state in which the respondent attended college, adjusted for the age of the respondent in each year of college. This adjustment for age is important in the present study as the sample of veterans is older than the normal undergraduate population (average age at college graduation was 26) and therefore had substantially higher opportunity costs. For the graduate school years the average earnings of white college graduates in the state of graduate school at the appropriate ages were used. The Census data does not provide the necessary race-age-education earnings breakdown by state so the figures were calculated by interpolation from national and regional averages.[7]

The Census data on foregone earnings may systematically understate the opportunity costs of the respondents. The respondents are all from the upper half of the population ability distribution and therefore may have had higher opportunity costs than the population average for their age group. However, the earnings of the average person of the age at which the respondents attended college would be augmented by the return to several years of labor force experience. Taubman and Wales use starting salaries of the NBER-Thorndike respondents as an alternative measure of opportunity costs but find that they are unaffected by ability and the amount of education. Their predicted initial salary in 1947 is $4,089 for those with some college, $3,464 with an undergraduate degree and $3,460 for those with graduate education. The average opportunity cost for the respondents from the Census data is $4,744 or $3,648 in 1947 dollars.

Conventional wisdom has it that many other factors determine earnings as well as the specified human capital investments. Social background, luck and ability can affect the dispersion in observed rates of return among individuals. However, estimates of the basic earnings function discussed in Section II provide unbiased estimates of the expected value of the distribution of rates of return. The effect of ability and social class on the dispersion of rates of return is examined in Section III.

II. Estimation of Rates of Return

Estimates of various specifications of the basic earnings function for 1969 earnings are shown in Table 1. In the first set of equations it is assumed that foregone earnings are the only cost of schooling. In the second set expenditures per full-time equivalent student are used as the cost of direct social investment. Finally, the last set of two equations uses tuition payments as a measure of direct private investments.[8] The sample sizes for the expenditure and tuition equations differ because of the availability of the direct cost data.[9]

Each equation allows for c rent rates of return to the direct and indirect components of investment, r_D and r_I, respectively. That is, the investment variables can be written as:

$$r_I s_i + r_D \sum_{j=1}^{s_i} \frac{D_{ij}}{E_{ij}}$$

This follows from the definition of costs, $C_{ij} = D_{ij} + E_{ij}$ where D_{ij} is the

direct investment cost, either tuition or expenditures. In addition, the second equation of each set disaggregates the investment variables into graduate and undergraduate components. That is, separate variables are included for direct and indirect investments in the form of graduate and undergraduate training.

The formulation of the indirect investment component implies that students forego a full years income. An alternative assumption that part-time and summer work during schooling is on average one-fourth of full-time earnings is used to adjust the estimated rates of return upwards.[10] Many of the respondents also had access to the GI Bill which paid monthly stipends to full-time students and covered tuition payments up to $500.[11] The calculated investment variables ignore these stipends and therefore coefficients are lower than the rates of return earned by the respondents. Clearly, private rates of return are increased when the GI Bill stipends are deducted from costs.

When direct investment costs are ignored the estimated rate of return to investments in college is 5.04 per cent. Equation (2) indicates that the rate of return to undergraduate schooling (6.44 per cent) exceeds the return to graduated schooling (3.94 per cent). The coefficients differ significantly when tested at the 10 per cent level, but not at the 5 per cent level.[12] This is not surprising because the number of years of graduate and undergraduate schooling are correlated.[13]

The rate of return coefficients are somewhat lower than the generally accepted figures for the return to college investments. If part-time work

is set at three months per year, the rate of return should be increased by one-third. If, in addition, an average stipend of $1,000 per year is deducted from direct costs the true value of k is not one but .48 and the private rate of return is (5.04) x (1/.48) = 10.6 per cent.[14] The adjusted rates of return from equation (2) are 14.0 per cent for undergraduate and 7.1 per cent for graduate training. It is clear that without the GI Bill, rates of return on private investments in schooling would have been much lower than the commonly accepted estimates and would probably have discouraged many of the respondents from further educational investments.

The direct investment variable for social investments (expenditures) is added in equation (3) and for private investment (tuition) in equation (5). The proportion of variance explained rises dramatically from less than 5 per cent to about 8 per cent. The coefficient on indirect investments declines to just over .01 from .05; in the expenditure equation it is barely twice its standard error. The coefficients on the direct investment variables are significantly larger in both equations (3) and (5). The differences in magnitude depend on the adjustments made in interpreting the coefficients on direct and indirect investments. Beta coefficients provide a measure of relative importance in explaining variation in earnings. For tuition the beta coefficient on direct investment is 5.6 times that for indirect investment and for expenditures the ratio is 3.5.

The investment variables are adjusted for part-time work by students and differential growth trends in investment costs and earnings.[15] The adjusted rates of return from equations (3) and (5) of Table 1 are shown

in Table 2. The difference between the rate of return on direct and indirect investments is still large. The results suggest that full-time college attendance has a large consumption component because the economic incentives for part-time attendance are large.[16]

The total private and social returns to educational investments can be calculated by taking weighted averages of r_D and r_I. The weights used are the average levels of the investment variables adjusted for part-time work and the secular change in costs. The total rate of return to private investment is 5.57 per cent[17] and to social investment 5.78 per cent.[18] Although direct and indirect returns are about one-fourth larger for private investments than social investments, the total returns are almost identical. This is expected since indirect costs are a larger fraction of private than social investment costs. For the same reason, the total returns are not very sensitive to changes in the direct investment adjustment procedure.

Foregone earnings are 72.5 per cent of total social investment and 82.6 per cent of total private investment. The variance in foregone earnings is, however, only 50.5 per cent of the variance in total social investment and 75.4 per cent of the variance in total private investment. Years of schooling is hardly an adequate proxy for total schooling investment. The total rates of return are both smaller than the comparable rate of return from equation (1). When foregone earnings are used as a proxy for all investments the return is 6.6 per cent (i.e. the coefficient on s, adjusted for part-time work by students).

For the most part, the respondents attended college after spending several years in the Armed Forces and were therefore about four years older than the average college student. This four-year age difference almost doubles their potential earnings as students. The total returns that would have been earned by younger students with opportunity costs reduced to one-half of those estimated are 8.0 per cent for total private investments and 8.1 per cent for total social investment.

As previously noted many of the respondents benefited from the GI Bill which reduced private costs substantially. Adjusting for part-time work and a $1,000 annual stipend increases the return on indirect private investments to 3.42 per cent.[19] Assuming that each respondent also received a tuition stipend (up to a $500 maximum) reduces the average level of direct private investments by 80 per cent, and yields a private return on the average direct private investment of 121.3 per cent. However, direct investments are only a small fraction of the total; the total privare return on investments made by the respondents is 9.91 per cent.

In equations (4) and (6) of Table 1 both the indirect and direct investment variables are disaggregated into undergraduate and graduate school components. The disaggregation adds less than 1 per cent to explained variance, but the increase is significant at the 1 per cent level.[20] The results indicate that there are large and significant differences in the rates of return earned at the graduate and undergraduate level. The return on indirect investments is negative for graduate studies. Interestingly enough, the returns to direct social and private investments are larger for graduate than undergraduate studies.

The increase in returns to direct graduate school investments over undergraduate investments seems to contradict the expected decline in the rate of return with the amount of investment. However, the total rate of return to graduate education is less than the total rate of return to undergraduate education for both the social and private investment equations. Table 3 shows the total returns adjusted for part-time work and the secular change in costs, as discussed previously. The total returns to undergraduate investments are more than twice the returns to graduate training. This difference is much larger than the difference suggested by the foregone earnings coefficients in equation (2). The results do confirm the idea that there tends to be over investment in graduate training.[21]

The other coefficients of the model all have the expected signs. The experience coefficient variables cannot be solved for both the rate of return to post-school investments and the value of k in the first job. The coefficient on experience is the product of the rate of return and k. A coefficient of .02 suggests therefore that a returr of 10 per cent is consistent with an initial k of .2. The two coeffici... together can be solved for the span of the post-schooling investment. The c...ffi- cients indicate that the post-school investment period is about twenty-five years, it ends at an average age of 52 for this sample.[22] The elasticity of annual earnings with respect to weeks worked, the coefficient on ln W, is about .4. A final remark concerns the low value of the co-efficients of determination. These can be explained by the relatively

homogeneous nature of the sample. All the coefficients themselves are highly significant.

The proportion of variance explained can be raised by somewhat less than 2 per cent by adding a measure of ability.[23] As would be expected the ability measure reduces the rate of return coefficients. For example, when years of schooling is the only investment variable, its coefficient is reduced from 5 per cent to 4.4 per cent with ability included, a reduction of almost 15 per cent. The reduction in the direct social investment (expenditure) coefficient is somewhat smaller, about 13 per cent. The coefficients on the direct private investment variables (tuition) are reduced by about 10 per cent when ability is included in the equation.

III. The Effect of Ability and Socio-Economic Status on Returns

The estimated rate of return coefficients are the mean values of the distribution of returns received by individuals. Human capital theory states that the return earned by a particular individual depends on both his supply and demand curves for investments. Becker suggests that supply will depend upon opportunity factors and the demand curves on ability. An individual with higher ability will make more human capital investments because his demand curve is higher. If all individuals face the same opportunities (supply curve) the more able person will earn a higher return. Similarly, individuals with greater opportunities will invest more than others with the same ability (demand curve).

The effect of ability and opportunity factors on the dispersion of estimated rates of return are examined by segmenting the sample into

ability and socio-economic status groups. Ability quartiles were calculated from a constructed IQ measure.[24] A socio-economic status variable based on father's occupation was used as a rough measure of opportunity.[25] The earnings functions were reestimated with college investment variables classified by ability or socio-economic status. That is, if X_n is a dummy variable with a value of 1 if the respondent is in the n^{th} group, then the coefficient on $(X_n s)$ is the indirect rate of return for individuals in the n^{th} group. Only the schooling investment variables are categorized by the ability or status groups. The other variables in the equation have the same coefficient for the whole sample.

In Table 4 the investment variables are categorized by ability quartiles with 1 being the lowest and 4 the highest. In Table 5 the investment variables are categorized by the socio-economic status groups indicated by H, M, and L subscripts. The categorization by ability or socio-economic status adds significantly to the proportion of variance explained.[26]

The rate of return coefficients do indicate that returns tend to increase with both ability and socio-economic status. The strongest trends are in the equations with no direct investment variable. Those equations suggest that persons in the highest ability quartile earn more than twice the return of those in the lowest quartile and that persons from the high socio-economic status group have a return which is over 40 per cent higher than those in the low group.

Total private and social rates of return by ability and status groups are shown in Table 6. The regression coefficients are adjusted for part-time work and secular cost changes, as before. Returns increase consistently

with both status and ability. The increase in returns with ability is not as large as the increase shown in the equation without a direct investment variable. The return for high status group is consistently about 40 per cent larger than the return to the low status group.

If all individuals in the sample have the same opportunities (common supply curve) then persons with higher ability should have higher returns and higher levels of investment. The average number of years of college in the highest ability quartile is 4.4, about 24 per cent more than the lowest ability quartile. However, more able students also make more expensive college investments. Their direct costs (private and social) are about 40 per cent greater than the average for the lowest ability quartile. Finally, the assumption of a common supply curve may be warranted for this sample as all the respondents had access to the GI Bill.

If all the respondents had the same demand curve then increased opportunity (higher supply curve) would yield higher returns on lower amounts of investment for higher status groups. Although the private and social returns earned do increase somewhat with socio-economic status, there is no discernible difference in the average number of years of college. The direct social investment costs are about 14 per cent higher for persons from the high socio-economic status group than for persons from the low socio-economic group.

IV. Conclusion

The major conclusion to be drawn from this study is that estimates of the rate of return from college which ignore institutional differences

in expenditures and tuition are biased upwards. This situation results from the tendency of students with higher earnings potential to make more expensive investments. The second conclusion to emerge from this study is that the returns to the direct and indirect components of investments are strikingly different. More research on this issue is clearly in order to judge whether part-time college attendance should be encouraged.

The difficulty in arriving at a unique measure of the returns to college that can be applied to future investments are highlighted by these results. Alternative adjustments and assumptions can alter the estimated return. The respondents in the NBER sample seem to have a very low return but when the GI Bill stipends are considered, the private return is comparable to most estimates. Care should be taken in applying the ex post returns from specific samples to present or future investments. However, the systematic differences in the returns to graduate and undergraduate training, to direct and indirect investment and with ability and socioeconomic class are suggestive of the importance of these differences. Emphasis on the size of the rate of return has tended to distract from the importance of the differences in returns due to the several factors discussed.

FOOTNOTES

[1]Early studies of returns, such as Becker use aggregate average estimates of costs and returns. More recently, estimates of returns from a human capital earnings functions, such as Chiswick and Mincer, use the number of years of schooling as an index of investment costs because of the paucity of data on other differences in investment costs.

[2] small literature on the quality of schooling by Welch, Solmon, Solmon and Wachtel and others has demonstrated the importance of differences between schools in determining earnings.

[3]The initial time period is assumed to be the age of high school graduation since this study is devoted to the returns to college education.

[4]Data on time spent in the military is not available. It is therefore assumed that no human capital investments took place during military service unless the initial job experience preceded the war and then military experience is considered part of labor force experience. About 20 per cent of the respondents reported an initial job prior to 1945.

[5]The expenditure data was obtained from unpublished U.S. Office of Education sources and refers to the 1963-64 school year. The data are for gross current expenditures, no allowance is made for the capital account of colleges. The tuition data are taken from Higher Education: Basic Student Changes, 1962-63, U.S. Office of Education, Circular 711. Most

FOOTNOTES (continued)

of the respondents, however, attended college in the immediate postwar years. It is therefore necessary to assume that cost differences among colleges remained unchanged. There is some limited evidence in Solmon that college cost and quality rankings are fairly constant over time.

[6] The 1960 Census is used because it provides more detailed data than previous censuses and the data is almost coincident with the cost data. The tuition and expenditure cost data are adjusted to the Census income year (1959) by the consumption expenditures deflator.

[7] Earnings of adult white male high school and college graduates for each state and region were derived from the nonwhite and total data. Regional data for age and education classes of white male earnings were used to approximate state medians for 22-24 year old high school graduates and 25-29 year old college graduates. The ratio of all adult white male earnings in each state to the appropriate regional age group for each education class was used to make the adjustment. Finally, national differences in income by age for each education class were used to adjust the estimated state median earnings for 22-24 year high school graduates and 25-29 year old college graduates to the age of the respondent at the time of his schooling.

FOOTNOTES (continued)

[8]For schools with different tuition charges for residents and non-residents, the resident tuition is used for undergraduates only if the state of the undergraduate college is the same as the state of the respondents high school, and for graduates if the state of undergraduate and graduate school are the same.

[9]Of the 5,086 respondents, 1,246 never attended college ane are excluded from the regressions along with respondents with zero earnings in 1969, all medical doctors and airplane pilots. The name of college attended or the tuition and cost data was not available for about 600 respondents leaving about 3,000 observations for the regressions.

[10]The fraction one-fourth is suggested by Becker.

[11]The stipend varied with the number of dependents and several changes in the law during the postwar period. Solmon estimates the average stipend during the late 1940's at $100 per month.

[12]The test value for the null hypothesis that the coefficients on s_U and s_G are equal is $F(1,3039) = 3.83$.

[13]The simple correlation of s_U and s_G is .33. The mean number of years of schooling is 15.96, with a standard deviation of 2.0. 29 per cent of the respondents have some graduate training, and 37 per cent only an undergraduate degree, the remainder have between 13 and 15 years of schooling.

FOOTNOTES (continued)

[14]The calculation is:

$$k = \frac{C}{E} = \frac{3/4\ (3747) - 1000}{3747} = .48$$

The average opportunity costs for the respondents was $4,744, as calculated from the 1960 Census, or $3,747 in 1948 dollars. The median year of college attendance is 1948. The corresponding adjustment for the undergraduate return is k = .46 and for graduate returns k = .55, as opportunity costs increase with education. The value of k for graduate students may be biased upwards because of increased scholarships and part-time work opportunities which reduce costs.

If the average initial real salary in 1948 dollars ($5,602) is used as the opportunity cost, k = .57 and the rate of return would be 8.8 per cent. This would be a lower limit for the correction, assuming that the opportunity costs were equal to the average first job earnings.

[15]The direct investment variables, $\sum_j \frac{D_{ij}}{E_{ij}}$, utilize wage and cost data that post-date the respondents schooling. The true value of the variable is $\sum_j \frac{\overline{D}_{ij}}{\overline{E}_{ij}}$ where the bar indicates 1947-48 values. For expenditures $D = 2.27\ \overline{D}$ and for earnings $E = 1.89\ \overline{E}$. The growth rates are based on national average college expenditures and the average weekly wage in manufacturing. Substituting gives the proportional correction

FOOTNOTES (continued)

factor for the direct social investment variable. The regression coefficients on the measured variable should then be adjusted by the inverse or the ratio of growth in direct costs to the growth in earnings. The average tuition charge increased by the same percentage as earnings between 1947-48 and 1962-63. The average tuition charge for 1962-63 is based on the 1947-48 distribution of students between private and public institutions applied to the national average tuition in each type of school.

[16]Weiss concludes that there is little economic incentive for full-time as opposed to part-time study. The difference may be due to the larger role of part-time earnings of graduate students in his study.

[17]Stipends under the GI Bill are not subtracted from costs here.

[18]The standard errors of the total rates could not be calculated because the program used does not provide a covariance matrix of regression coefficients. However, an estimate of the covariance of r_D and r_I from some preliminary experiments which assumed constant opportunity costs for all individuals indicates that the standard error of the total rate is about .9 per cent.

[19]Based on equation (5), Table 1. See footnote 14 for the correction factor.

FOOTNOTES (continued)

[20]The test value for the expenditure equations is $F(2,3038) = 10.5$ and for the tuition equations it is $F(2,2997) = 6.04$.

[21]This conclusion is also reached by Taubman and Wales.

[22]These conclusions are based on Mincer's explicit formulation of a linearly declining net investment profile. See Mincer, p. 17.

[23]These results are not shown.

[24]The IQ variable was constructed from a factor analysis of the Air Force tests taken by the respondents in 1943. The quartiles are based on the test scores of all respondents, including those who did not attend college.

[25]Three groups were constructed, as follows:

High:	managerial, proprietor, professional, and technical
Medium:	office worker, salesman, foreman, skilled worker and others
Low:	service worker, and semi-skilled, unskilled and other blue collar.

49.7 per cent of the respondents are from the high socio-economic status group and 13.8 per cent from the low group.

FOOTNOTES (concluded)

[26]The equations in Tables 4 and 5 are compared to the corresponding equations in Table 1. The increase in R^2 is significant at the 1 per cent level for all equations except the socio-economic status categorizations of the expenditure and no direct investment equations which are significant at the 5 per cent level.

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TABLE 1

Earnings Functions for Investments in Higher Education[a]

	No Direct Investment[b]		Expenditures as Direct Investment[b]		Tuition as Direct Investment[c]	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	.2931	.3018	.4064	.4907	.5796	.6043
g	.0225(.0089)	.0195(.0090)	.0227(.0087)	.0198(.0088)	.0278(.0088)	.0224(.0089)
g^2	-.0004(.0002)	-.0003(.0002)	-.0005(.0002)	-.0004(.0002)	-.0006(.0002)	-.0004(.0002)
ln W	.4761(.0874)	.4700(.0874)	.4405(.0858)	.4121(.0857)	.3907(.0842)	.3790(.0842)
s_U		.0644(.0089)		.0326(.0095)		.0410(.0092)
s_G		.0394(.0076)		-.0273(.0136)		-.0155(.0125)
s	.0504(.0049)		.0124(.0059)		.0164(.0058)	
D_U				.1353(.0150)		.2064(.0246)
D_G				.1745(.0318)		.2973(.0589)
D			.1423(.0129)		.2164(.0205)	
R^2	.0463	.0475	.0834	.0897	.0788	.0825
S.E.	.4867	.4865	.4773	.4758	.4773	.4765

[a]Dependent variable is natural log of 1969 earnings. [b]Sample size is 3045. [c]Sample size is 3004.

Standard errors are in parentheses.

TABLE 2
Adjusted Rates of Return

	Social Investment (Expenditures)	Private Investment (Tuition)
r_I	1.65	2.19
r_D	16.92	21.64
Total Return	5.78	5.57

TABLE 3
Adjusted Total Rates of Return

	Social Investment	Private Investment
Undergraduate	7.67	8.11
Graduate	3.01	3.39

TABLE 4

Effect of Ability on Rates of Return[a]

	Direct Investment Variable:		
	None	Expenditure	Tuition
Constant	.4410	.5514	.6651
g	.0204(.0088)	.0236(.0087)	.0259(.0088)
g^2	−.0004(.0002)	−.0005(.0002)	−.0005(.0002)
ln W	.4481(.0870)	.4110(.0858)	.3769(.0842)
s_1	.0293(.0066)	−.0011(.0118)	.0115(.0097)
s_2	.0371(.0062)	−.0033(.0109)	.0032(.0092)
s_3	.0535(.0059)	.0103(.0104)	.0128(.0086)
s_4	.0620(.0055)	.0167(.0086)	.0278(.0077)
D_1		.1086(.0339)	.1385(.0506)
D_2		.1392(.0301)	.2226(.0450)
D_3		.1380(.0266)	.2558(.0424)
D_4		.1260(.0175)	.2016(.0315)
R^2	.0593	.0921	.0881
S.E.	.4836	.4754	.4753
N	3045	3045	3004

[a]Dependent variable is natural log of 1969 earnings.

Standard errors are in parentheses.

TABLE 5

Effect of Socio-Economic Status on Rates of Return[a]

	Direct Investment Variable		
	None	Expenditure	Tuition
Constant	.3454	.4850	.6232
g	.0222(.0089)	.0251(.0087)	.0273(.0002)
g^2	-.0004(.0002)	-.0005(.0002)	-.0006(.0002)
ln W	.4637(.0874)	.4211(.0856)	.3803(.0843)
s_L	.0386(.0070)	-.0018(.0131)	.0116(.0113)
s_M	.0486(.0055)	.0104(.0088)	.0171(.0079)
s_H	.0548(.0053)	.0062(.0075)	.0188(.0066)
D_L		.1329(.0347)	.1687(.0607)
D_M		.1245(.0218)	.1977(.0355)
D_H		.1439(.0160)	.2344(.0267)
R^2	.0487	.0869	.0819
S.E.	.4863	.4767	.4768
N	3045	3045	3004

[a]Dependent variable is natural log of 1969 earnings.

TABLE 6
Adjusted Total Rates of Return for
Ability and Status Groups

	Social Investment	Private Investment
Ability Group:		
1 (lowest)	3.3%	3.6%
2	4.0	4.2
3	5.5	5.8
4 (highest)	6.0	6.7
Socio-Economic Status:		
Low	4.0	4.1
Medium	5.0	5.4
High	5.5	6.2